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Test 568: Minneapolis-Moline Model GBD

Tractor Museum
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The Experiment Station
University of Nebraska College of Agriculture
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering
Dates of test: November 1 to November 7, 1955
Manufacturer: MINNEAPOLIS - MOLINE COMPANY, MINNEAPOLIS, MINNESOTA
Manufacturer's rating: Not rated

NEBRASKA TRACTOR TEST NO. 568

MINNEAPOLIS-MOLINE GBD

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption: Gal per hour	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hour	Water used gal per hour	Temp Deg F: Cooling med	Temp Deg F: Air	Barometer inches of mercury
TESTS B & C—100% MAXIMUM LOAD—TWO HOURS								
62.78	1300	4.081	15.38	0.456	0.00	197	71	29.090
TEST D——RATED LOAD—ONE HOUR								
55.90	1299	3.634	15.38	0.456	0.00	193	77	29.025
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)								
55.52	1299	3.615	15.36	0.457	...	194	78	.....
1.74	1418	1.056	1.65	4.259	...	165	73	.....
29.36	1359	2.329	12.61	0.557	...	173	76	.....
61.66	1245	4.060	15.19	0.462	...	202	77	.....
14.87	1378	1.692	8.79	0.799	...	171	76	.....
42.93	1331	2.962	14.49	0.484	...	179	74	.....
34.35	1338	2.619	13.12	0.535	0.00	181	75	29.010

TORQUE (At Dynamometer)										
Eng rpm	1293	1232	1162	1085	1022	948	873	804	741	667
Lb-ft	397.1	407.8	417.2	423.7	427.0	427.9	423.2	415.6	411.3	392.0
Dyn rpm	822	782	735	685	645	597	550	505	467	422

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lb	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption: Gal per hour	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Water used gal per hour	Temp Deg F: Cooling med	Temp Deg F: Air	Barometer inches of mercury
TEST H—RATED LOAD—TEN HOURS—3rd Gear											
43.70	3846	4.26	1302	5.24	3.252	13.44	0.522	0.00	178	62	28.574
TESTS F & G—100% MAXIMUM LOAD											
45.04	7333	2.30	1301	15.24	1st gear (part throttle)				181	69	28.760
54.99	5899	3.50	1299	8.88	2nd gear				186	69	28.770
55.44	4978	4.18	1301	7.00	3rd gear				192	69	28.770
55.05	3370	6.13	1299	5.05	4th gear				174	67	28.730
47.10	1203	14.68	1297	2.03	5th gear				179	67	28.730
TEST J—OPERATING MAXIMUM LOAD											
50.56	4833	3.92	1306	15.36	3rd gear (part throttle)				178	55	28.860

FUEL, OIL and TIME Diesel Fuel Cetane No. 50 (rating taken from oil company's typical inspection data) **Weight per gallon** 7.020 lb **OIL** SAE 20 **To motor** 3.752 gal **Drained from motor** 3.112 gal **Total time motor was operated** 39 hours.

CHASSIS Type Standard **Serial No.** G 1309000143 **Tread width** rear 62" front 54¼" **Wheel base** 96 3/16" **Hydraulic control system** direct engine drive **Advertised speeds mph** first 2.7 second 3.8 third 4.4 fourth 6.3 fifth 14.7 reverse 2.1 **Belt pulley** diam 16" face 7" **rpm** 741 **Belt speed** 3104 fpm **Clutch** twin disc clutch operated by hand lever **Seat** pressed steel mounted on coil spring with snubber **Brakes** disc brakes operated by two foot pedals **Equalized** no **Power take-off** conventional type.

ENGINE Make MINNEAPOLIS-MOLINE DIESEL **Type** 6 cylinder vertical **Serial No.** 06701051 **Crankshaft mounted** lengthwise **Head** I **Lubrication** pressure **Bore and stroke** 4¼" x 5" **Rated rpm** 1300 **Compression ratio** 14.9 to 1 **Displacement** 425.5 cu. in. **Port diameter valves** inlet 1½" exhaust 1⅜" **Governor** variable speed centrifugal **Starting system** 12 volt (3-12 volt batteries) **Air cleaner** oil washed wire mesh **Muffler** was used **Oil filter** two filters each with replaceable waste cartridge element **Fuel filter** one primary screen, one secondary replaceable elemnt, one final replaceable element **Cooling medium temperature control** thermostat.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with fuel pump set to develop approximately 65 corrected maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, and J were made with the same setting.

TIRES, WHEELS AND WEIGHT

	Tests F, G & H	Test J
Rear wheels		
Type	Cast iron	Cast iron
Liquid ballast	968 lb each	None
Added cast iron	1230 lb each	None
Rear tires		
No. and size	Two 15-34	Two 15-34
Ply	6	6
Air pressure	16 lb	16 lb
Front wheels		
Type	Pressed steel	Pressed steel
Liquid ballast	None	None
Added cast iron	None	None
Front tires		
No. and size	Two 7.50-18	Two 7.50-18
Ply	4	4
Air pressure	28 lb	28 lb
Height of drawbar	17 inches	19 inches
Static weight		
Rear end	9720 lb	5385 lb
Front end	2600 lb	2610 lb
Total weight as tested with operator	12495 lb	8170 lb

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F. and 29.92" Hg)	58.15	65.25
2. Observed maximum horsepower (tests F and B)	55.44	62.78
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (formerly ASA Eand SAE ratings)	43.61	55.46

We, the undersigned, certify that this is a true and correct report of official tractor test No. 568.

L. F. LARSEN
Engineer-In-Charge

L. W. HURLBUT
G. W. STEINBRUEGGE
J. J. SULEK
Board of Tractor
Test Engineers

EXPLANATION OF TEST REPORT

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissible include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

BELT HORSEPOWER TESTS

TEST B: The throttle valve is held wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

TEST C: For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is held wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors, which have an altogether different fuel system.

TEST D: The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

TEST E:

Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads, of 20 minutes each: rated load, no load, ½ rated load, maximum load at wide open throttle valve, ¼ and ¾ rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

Torque, lb-ft at dynamometer, is obtained with wide open throttle and sufficient load is applied to give several readings.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instrument in the test car. All tests are made on the same dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

TEST F: A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

TEST G: Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

TEST H: Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

TEST K: Similar to test J except that the smallest tires and lightest wheels offered by the manufacturer are used.